



**WACKER**

**SILICONES**

**ELASTOSIL<sup>®</sup>**

BONDING AND SEALING WITH SILICONES

CREATING TOMORROW'S SOLUTIONS

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# SILICONE ADHESIVES AND SILICONE SEALANTS – STRONG PARTNERS TO INDUSTRY

**Technical innovations and rapid production development cycles are routine in specialized industries. To achieve market leadership in the long term however, it is necessary to set standards. Modern silicone-based materials increasingly play a key role in achieving such goals.**

#### **Innovative Adhesives**

Against a background of rising cost pressure and stricter quality specifications, traditional mechanical joining means, such as screws, soldering and riveting, are increasingly being superseded by versatile adhesives. Bonding with WACKER flowable or non-sag silicone adhesives provides significant advantages in performance and efficiency, with direct commercial benefits.

#### **Dependable Gaskets**

Since gaskets operate at the interface between interior and exterior, hot and cold, or wet and dry, they must withstand the most extreme conditions. These severe physical challenges are met perfectly by WACKER silicone sealants. There are obvious reasons for this. Together with direct-application gasketing technologies, they offer significant cost savings.

#### **Versatile Properties**

Our adhesives and sealants feature excellent properties, such as extreme temperature resistance, excellent adhesion, outstanding stability to weathering and radiation, superior chemical resistance and exceptional mechanical properties, to name but a few. However, it is the smart combination of these properties that makes silicone rubber materials suitable for use in a wide range of adhesive and sealing applications.

#### **Efficient Products**

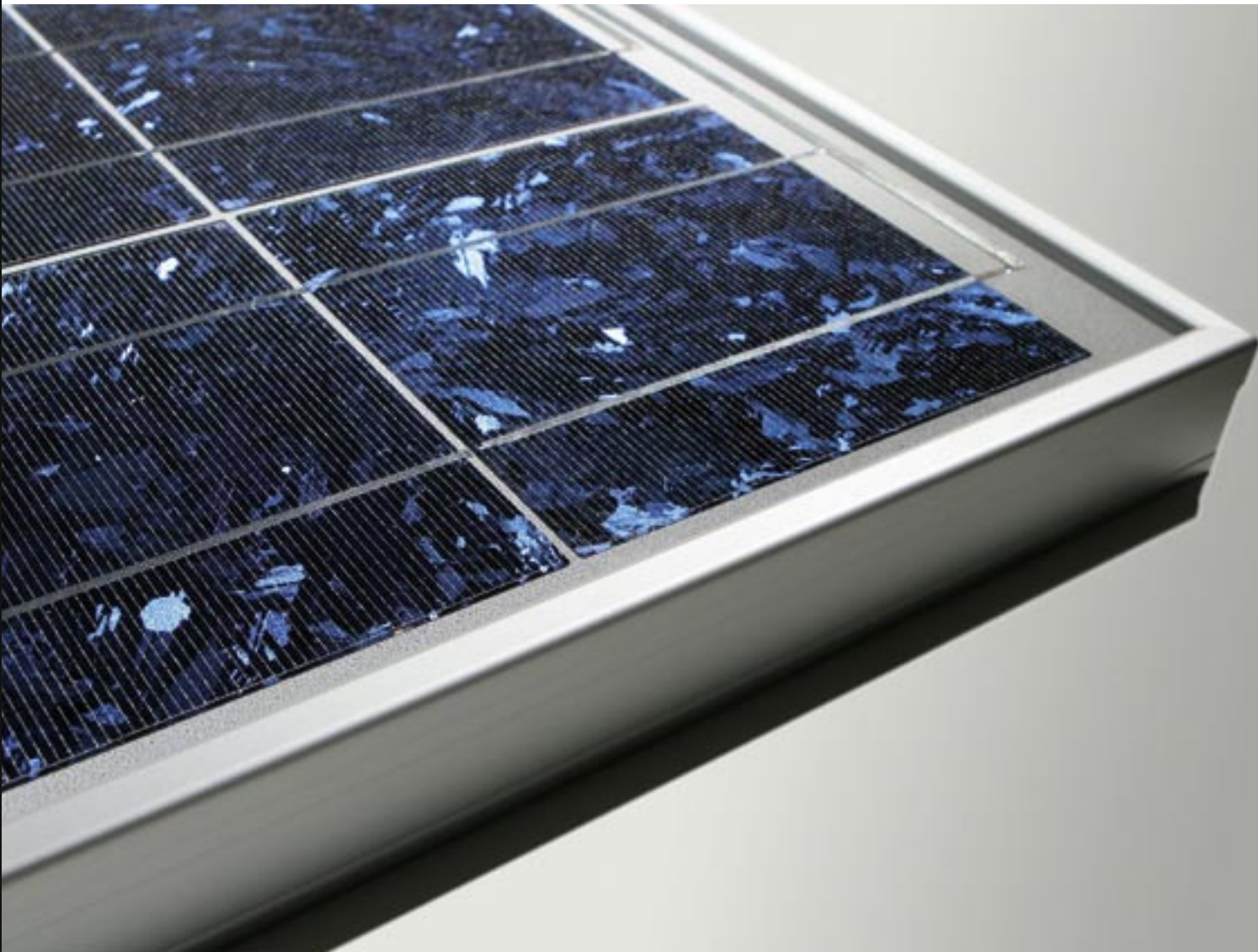
WACKER silicone adhesives and sealants are based on many years of innovative research and comprehensive technological expertise. ELASTOSIL® and GENIOSIL® meet the strictest standards for functionality and quality. They are backed up by global service and support, and possess a versatile spectrum of properties and potential applications. And the bandwidth of new applications is by no means exhausted. Seize the opportunities.

#### **Applications**

- Household appliances
- Electronics and electrics
- Automotive and aeronautical engineering
- Satellite and space technology
- Buses, rail and commercial vehicles
- Boat- and shipbuilding
- Solar modules
- Low-power motors
- Lighting

# OUR ADHESIVES PRODUCE STABLE BONDS

Bonding a solar panel into an aluminum frame with WACKER silicone adhesives



In modern high-speed production lines, silicone adhesives are progressively superseding traditional mechanical joining technologies such as screws, soldering or riveting. There are obvious reasons for this: Elastic bonding with silicone rubber has crucial advantages as regards handling, functionality and cost effectiveness.

#### Handling

WACKER silicone adhesives can be easily and economically applied manually or with automated dispensing equipment. Assembly then takes place before curing. Our products can bond very heterogeneous materials together, while adhering to both joint surfaces. Disassembly is not possible after curing.

#### Products

To suit individual production requirements, we offer our customers ELASTOSIL® and GENIOSIL® silicone rubber in the form of one or two-part adhesive systems. The main difference between these room-temperature-curing systems is their processing characteristics. Our technical support experts will be glad to help you in choosing the ideal silicone adhesive for your needs.

#### Benefits

The use of silicone adhesives saves costs at different levels of the manufacturing process: First, automated adhesive applications reduce costs for labor and stockholding. Then, our products offer excellent corrosion protection, while efficiently compensating for vibrations and mechanical loading of the joint parts. They also allow wider tolerances for machining the joint parts.

#### Applications

Silicone adhesives have many diverse applications in key industries:

- Household appliances
- Electronics and electrics
- Automotive engineering
- Satellite and space technology
- Buses, rail and commercial vehicles
- Boat- and shipbuilding
- Solar modules
- Low-power motors
- Lighting



# PRODUCT RECOMMENDATION – ELASTIC BONDS

Product	GENIOSIL® N 550	ELASTOSIL® RT 774	ELASTOSIL® E 4	ELASTOSIL® E 10	ELASTOSIL® E 14	ELASTOSIL® E 47
<b>Features</b>						
High-temperature resistance up to	120 °C	180 °C	180 °C	230 °C	250 °C	180 °C
Low-temperature resistance down to	-60 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C
Compressible						
Oil resistant						
Coolant resistant	●					
UL-listing						
Paintable	●					
<b>Primerless adhesion to*</b>						
Glass	●	●	●	●	●	●
Stainless steel	●	●	○	○	○	●
Aluminum	●	●	○	○	○	●
Ceramics	●	●	●	●	●	●
Plastics	●	○	○	○	○	○
<b>Consistency</b>						
Non-sag	●	●	●		●	●
Self-leveling						
Flowable				●		
<b>Curing characteristic</b>						
Room temperature curing	●	●	●	●	●	●
Thermal curing						●
<b>Curing system</b>						
One-part system	Alcoxy		Acetoxy	Acetoxy	Acetoxy	Acetoxy
Two-part system	Condensation					
Available in small packages	●		●	●	●	●

\* Perform individual tests on the specific substrate before application.

● Adhesion good

○ Adhesion dependent on substrate

The product list only represents a selection of standard products. In personal talks, we will be glad to demonstrate other special products to you – tailored to your particular application.

ELASTOSIL® E 143 F VP	ELASTOSIL® N 199	ELASTOSIL® N 2010	ELASTOSIL® N 2034	ELASTOSIL® N 2170	ELASTOSIL® N 2189	ELASTOSIL® N 2197	ELASTOSIL® N 2199	ELASTOSIL® N 9132 (S)
220 °C	180 °C	180 °C	180 °C	180 °C	200 °C	180 °C	160 °C	180 °C
-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C
●					●			
●					●			
								● (UL 94 VO)
●	●	●	●	●	●	●	●	●
○	●	●	●	●	●	●	●	●
○	●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●	●
○	○	○	○	○	○	○	○	●
●	●			●	●	●	●	●
		●	●					
●	●	●	●	●	●	●	●	●
Acetoxy	Oxime	Alcoxy	Alcoxy	Alcoxy	Alcoxy	Alcoxy	Alcoxy	Alcoxy
	●	●	●		●	●	●	●

Formed-in-place gasketing

Cured-in-place gasketing

Products

# OUR GASKETS SEAL BY BONDING

Sealing of a headlamp glass to the housing with WACKER silicone sealants.





**Efficient gaskets must perform with absolute reliability for as long as possible. Whether for car engines or electronic components – the application of our silicone sealants in liquid form ensures maximum functionality even under extremes of temperature and material loading.**

#### **Handling**

WACKER silicone sealants can be applied manually or by industrial dispensing equipment. Formed-in-place gaskets require the sealed parts to be assembled before the silicone rubber is cured. The gasket material adheres at both sides, excluding any possibility of disassembly. The reliability of the seal is ensured by the bond between the silicone rubber and the joint parts.

#### **Products**

According to our customers' production processes and material requirements, we provide them with a range of ELASTOSIL® products, ranging from non-sag to flowable. Our technical service engineers will be glad to support you in choosing the best silicone sealant for your needs.

#### **Benefits**

Silicone sealants reduce material consumption and cut stockholding costs, since you do not need to store pre-formed gaskets. Compared to inserted gaskets, adhesive gaskets do not require the joint parts to have such high dimensional accuracy. In addition, the gasket material stays firmly in place without fixing. That permits simpler design of the parts and reduces development costs.

#### **Applications**

Products of the ELASTOSIL® range can be used in many industries:

- Household appliances
- Electronics and electrics
- Automotive engineering
- Aircraft construction
- Buses, rail and commercial vehicles
- Boat- and shipbuilding
- Solar modules
- Low-power motors

# PRODUCT RECOMMENDATION – FORMED-IN-PLACE GASKETING

Product	GENIOSIL® N 550	ELASTOSIL® RT 702	ELASTOSIL® RT 707 W	ELASTOSIL® RT 772	ELASTOSIL® RT 774
<b>Features</b>					
High-temperature resistance up to	120 °C	270 °C	270 °C	270 °C	180 °C
Low-temperature resistance down to	-60 °C	-45 °C	-45 °C	-45 °C	-45 °C
Compressible					
Oil resistant					
Coolant resistant	●				
UL-listing			● (UL 94 HB)	● (UL 94 HB)	
Paintable	●				
<b>Primerless adhesion to*</b>					
Glass	●	●	●	●	●
Stainless steel	●	●	○	●	●
Aluminum	●	●	○	●	●
Ceramics	●	●	●	●	●
Plastics	●	●	○	○	○
<b>Consistency</b>					
Non-sag	●	●			●
Self-leveling			●		
Flowable				●	
<b>Curing characteristic</b>					
Room temperature curing	●			●	●
Thermal curing		●	●		
<b>Curing system</b>					
One-part system	Alcoxy	Addition	Addition		
Two-part system				Condensation	Condensation
Available in small packages	●				

\* Perform individual tests on the specific substrate before application.

● Adhesion good

○ Adhesion dependent on substrate

The product list only represents a selection of standard products. In personal talks, we will be glad to demonstrate other special products to you – tailored to your particular application.

ELASTOSIL® E 4	ELASTOSIL® E 14	ELASTOSIL® E 47	ELASTOSIL® N 2189	ELASTOSIL® N 2197	ELASTOSIL® N 2199	ELASTOSIL® N 9132 (S)	ELASTOSIL® E 143 F VP
180 °C	230 °C	180 °C	200 °C	200 °C	180 °C	180 °C	220 °C
-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C
			●				●
			●				●
						● (UL 94 VO)	
●	●	●	●	●	●	●	●
○	○	●	●	●	●	●	●
○	○	●	●	●	●	●	●
●	●	●	●	●	●	●	●
○	○	○	○	○	○	●	○
●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●
●	●	●	●	●	●	●	●
Acetoxy	Acetoxy	Acetoxy	Alcoxy	Alcoxy	Alcoxy	Alcoxy	Acetoxy
●	●		●	●	●	●	

Formed-in-place gasketing

Cured-in-place gasketing

Products

# OUR GASKETS SEAL BY COMPRESSION

Preventing crevice corrosion in the interior of a dishwasher by sealing with WACKER silicones.



**Where flexibility is demanded, WACKER silicone sealants are unbeatable. Our gaskets really come to the fore in industrial applications where joints have to be disassembled.**

#### **Handling**

WACKER silicone sealants can be applied manually or fully automatically. In cured-in-place gasketing, the parts are assembled after vulcanization. The silicone sealant bonds to one part of the joint. The seal with the second joint member is formed by compression. Unlike FIPG systems, the parts can be disassembled at any time.

#### **Products**

We offer our customers standard ELASTOSIL® and GENIOSIL® products from non-sag to flowable for compression gaskets, depending on their product processes and material requirements. Our technical service engineers will be glad to support you in choosing the best silicone sealant for your needs.

#### **Benefits**

Silicone sealants feature excellent adhesion and reduced production costs. They stay firmly in place until assembly without fixing, allow simple groove designs and reduce material costs by minimizing sealant consumption.

#### **Applications**

Our products have potential applications in the most diverse of industries:

- Household appliances
- Electronics and electrics
- Automotive engineering
- Buses, rail and commercial vehicles
- Boat- and shipbuilding
- Low-power motors

# PRODUCT RECOMMENDATION – CURED-IN-PLACE GASKETING

Product	ELASTOSIL® RT 702	ELASTOSIL® RT 721	ELASTOSIL® RT 723	ELASTOSIL® RT 726
<b>Features</b>				
High-temperature resistance up to	270 °C	200 °C	200 °C	200 °C
Low-temperature resistance down to	-45 °C	-45 °C	-45 °C	-45 °C
Compressible				
Oil resistant			●	
Coolant resistant			●	●
UL-listing				
Paintable				
<b>Primerless adhesion to*</b>				
Glass	●	●	●	●
Stainless steel	●	●	●	●
Aluminum	●	●	●	●
Ceramics	●	●	●	●
Plastics	●	○	○	●
<b>Consistency</b>				
Non-sag	●	●	●	●
Self-leveling				
Flowable				
<b>Curing characteristic</b>				
Room temperature curing		●		
Thermal curing	●	●	●	●
<b>Curing system</b>				
One-part system	Addition			
Two-part system		Addition	Addition	Addition
Available in small packages				

\* Perform individual tests on the specific substrate before application.

● Adhesion good

○ Adhesion dependent on substrate

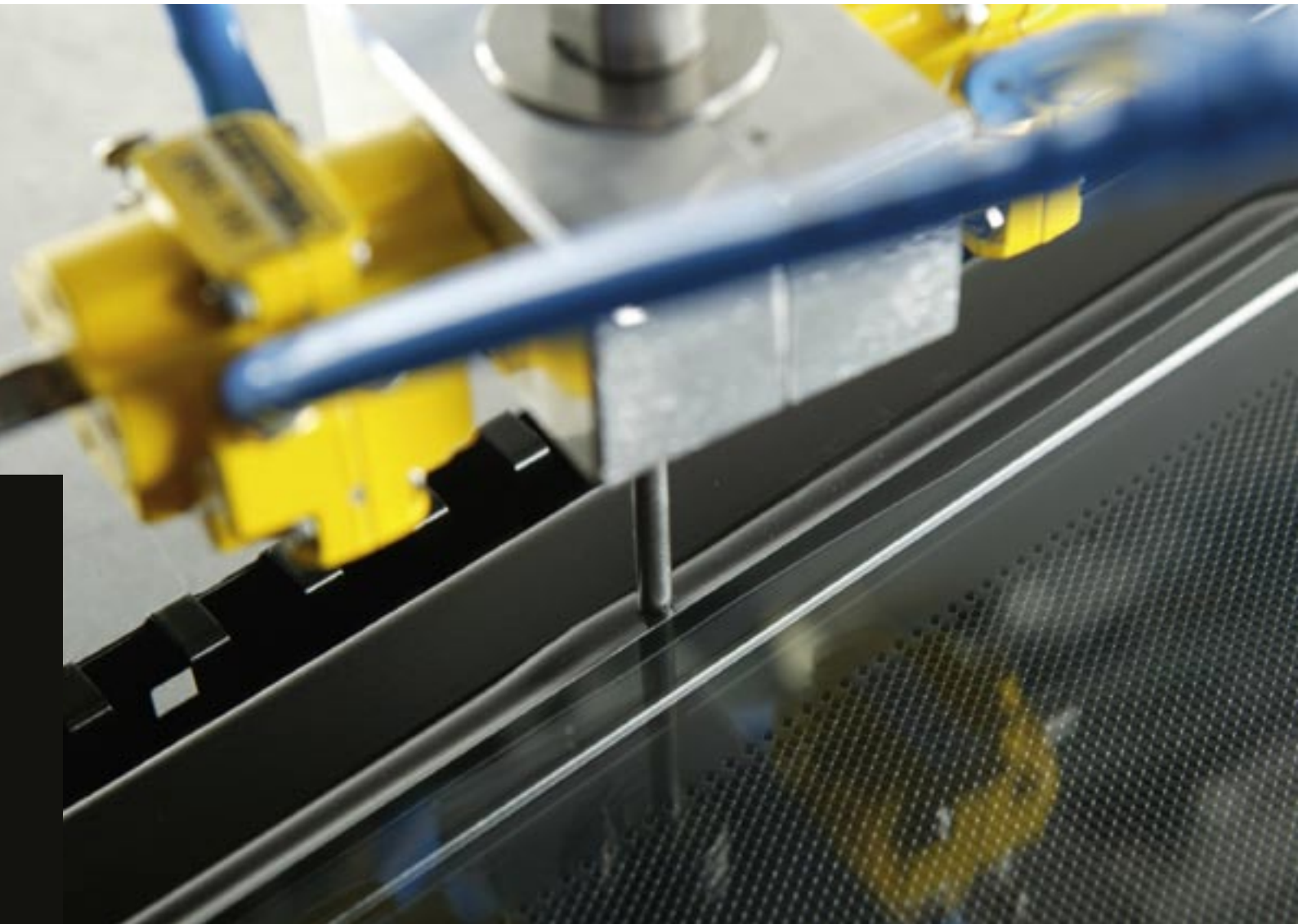
The product list only represents a selection of standard products. In personal talks, we will be glad to demonstrate other special products to you – tailored to your particular application.



ELASTOSIL® RT 727	ELASTOSIL® RT 773/T 77	ELASTOSIL® E 4	ELASTOSIL® E 14	ELASTOSIL® SC 835	ELASTOSIL® SC 870	ELASTOSIL® N 9132 (S)
200 °C	140 °C	180 °C	230 °C	220 °C	200 °C	180 °C
-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C	-45 °C
●	●			●	●	
●						
						● (UL 94 VO)
●	●	●	●	●	●	●
●	●	○	○	○	○	●
●	●	○	○	○	○	●
●	●	●	●	●	●	●
●	○	○	○	○	○	●
●	●	●	●		●	●
				●		
	●	●	●	●	●	●
●						
Addition	Condensation	Acetoxy	Acetoxy	Addition	Addition	Alcoxy
		●	●			●

# OUR PRODUCTS FEATURE IMPRESSIVE BONDING AND SEALING

Use of WACKER silicones to bond a glass pane in an oven door



**ELASTOSIL® and GENIOSIL® feature outstanding performance and efficiency. But the full effectiveness of our silicone adhesives and sealants only develops under your particular production requirements.**

**Individual Requirements**

Every individual application defines a profile of required material properties. These properties decide which silicone rubber is the best to choose. For example, the household appliance industry often requires a profile that combines extreme heat resistance with good adhesion. But your particular production conditions also have a major influence on the choice of the optimum silicone rubber system. For example, fully automatic mass production with rapid cycles puts entirely different requirements on the material compared with batchwise production in small production runs.

**Flexible Silicone Systems**

WACKER offers various silicone systems that differ greatly in terms of processing time and technology, curing rate and temperature, number of components, and availability. RTV-1 silicones are easy to process and are preferably used in batchwise production processes or where relatively long curing times are

Silicone Systems and Product Requirements	
<b>Rapid curing</b> ^ >	<p><b>RTV-2 Silicones</b></p> <ul style="list-style-type: none"> <li>- Addition-curing and condensation-curing two-part systems that vulcanize at room temperature</li> <li>- Dual-component metering equipment is needed to process them</li> <li>- Rapid curing in the order of minutes is achieved by working at elevated temperatures or selecting a suitable curing agent</li> </ul>
	<p><b>One-Part Systems</b></p> <ul style="list-style-type: none"> <li>- One-part systems that cure exclusively at high temperatures</li> <li>- Simple metering equipment suffices to process them</li> <li>- Curing is fast, sometimes taking only minutes</li> </ul> <p><b>RTV-1 Silicones</b></p> <ul style="list-style-type: none"> <li>- One-part systems that cure at room temperature</li> <li>- Simple metering equipment suffices to process them; these rubber grades can even be applied manually</li> <li>- Atmospheric moisture is needed for curing</li> </ul>
<p><b>Easy processing &gt;&gt;</b></p>	

permissible. In other conditions, it is preferable to use faster curing RTV-2 silicones or high-temperature-curing one-part silicones.

Talk to our experts. They will be glad to help you.

# SILICONE ADHESIVES AND SEALANTS ONE-PART-SYSTEMS

Product	Color	Density [g/cm <sup>3</sup> ]	Viscosity	Pot life/ skin-over time
ELASTOSIL® E 4	Transparent	1.10	non-sag	15 min
ELASTOSIL® E 10	Red	1.10	10 000 mPa s	15 min
ELASTOSIL® E 14	Red	1.24	non-sag	15 min
ELASTOSIL® E 47	Transparent	1.07	non-sag	15 min
ELASTOSIL® E 143 F VP	Red	1.35	non-sag	15 min
ELASTOSIL® N 199	Transparent	1.10	non-sag	40 min
ELASTOSIL® N 2010	Transparent	1.01	10 000 mPa s	20 min
ELASTOSIL® N 2034	Gray	1.15	40 000 mPa s	20 min
ELASTOSIL® N 2170	White, gray, black, transparent	1.03	non-sag	15 min
ELASTOSIL® N 2189	Black	1.30	non-sag	30 min
ELASTOSIL® N 2197	Gray	1.26	non-sag	25 min
ELASTOSIL® N 2199	Transparent	1.05	non-sag	20 min
ELASTOSIL® N 9132 (S)	White	1.28	non-sag	15 min
ELASTOSIL® RT 702	Black	1.21	non-sag	6 months
ELASTOSIL® RT 707 W	White	1.12	65 000 mPa s	6 months
GENIOSIL® N 550	Gray	1.30	non-sag	25 min

\* Complies with the guaranteed minimum shelf life;  
generally the period between the manufacturing date  
and the best-use-before-date is longer.

Curing time	Hardness Shore A	Tensile strength [N/mm <sup>2</sup> ]	Elongation at break [%]	Volume resistivity [Ohm cm]	Shelf life* [Months]
24 h/mm 23 °C/50 %RH	16	1.5	600	1E+14	12
24 h/mm 23 °C/50 %RH	25	3	300	1E+14	9
24 h/mm 23 °C/50 %RH	36	3	300	1E+14	9
24 h/mm 23 °C/50 %RH	35	4.5	450	1E+14	12
24 h/mm 23 °C/50 %RH	45	4	200	1E+14	12
24 h/mm 23 °C/50 %RH	35	4	450	1E+14	9
24 h/mm 23 °C/50 %RH	25	1	200	1E+14	6
24 h/mm 23 °C/50 %RH	35	1.5	200	1E+14	6
24 h/mm 23 °C/50 %RH	18	0.6	300	1E+14	9
24 h/mm 23 °C/50 %RH	44	2.3	250	1E+14	6
24 h/mm 23 °C/50 %RH	35	2.5	350	1E+14	6
24 h/mm 23 °C/50 %RH	40	2.5	300	1E+14	6
24 h/mm 23 °C/50 %RH	33	2.4	600	1E+14	9
10 min at 140 °C 3 min at 200 °C	45	3.1	200	1E+14	6
10 min at 140 °C 3 min at 200 °C	40	3.0	250	1E+14	6
24 h/mm 23 °C/50 %RH	55	3.0	350	1E+14	6

# SILICONE ADHESIVES AND SEALANTS TWO-PART-SYSTEMS

Product	Color	Density [g/cm <sup>3</sup> ]	Viscosity	Pot life/ skin-over time
ELASTOSIL® RT 721	Black	1.00	non-sag	8 h
ELASTOSIL® RT 723	Gray	1.07	non-sag	> 5 d
ELASTOSIL® RT 727	Black	1.10	non-sag	> 24 h
ELASTOSIL® RT 772	Gray	1.27	30 000 mPa s	12 min
ELASTOSIL® RT 773	Black	0.70	non-sag	< 30 min
ELASTOSIL® RT 774	Black	1.35	non-sag	30 min
<b>2-part Silicone Foams</b>				
ELASTOSIL® SC 835	Reddish-brown	0.45	15 000 mPa s	4 min
ELASTOSIL® SC 870	Gray	0.35	50 000 mPa s	2 min

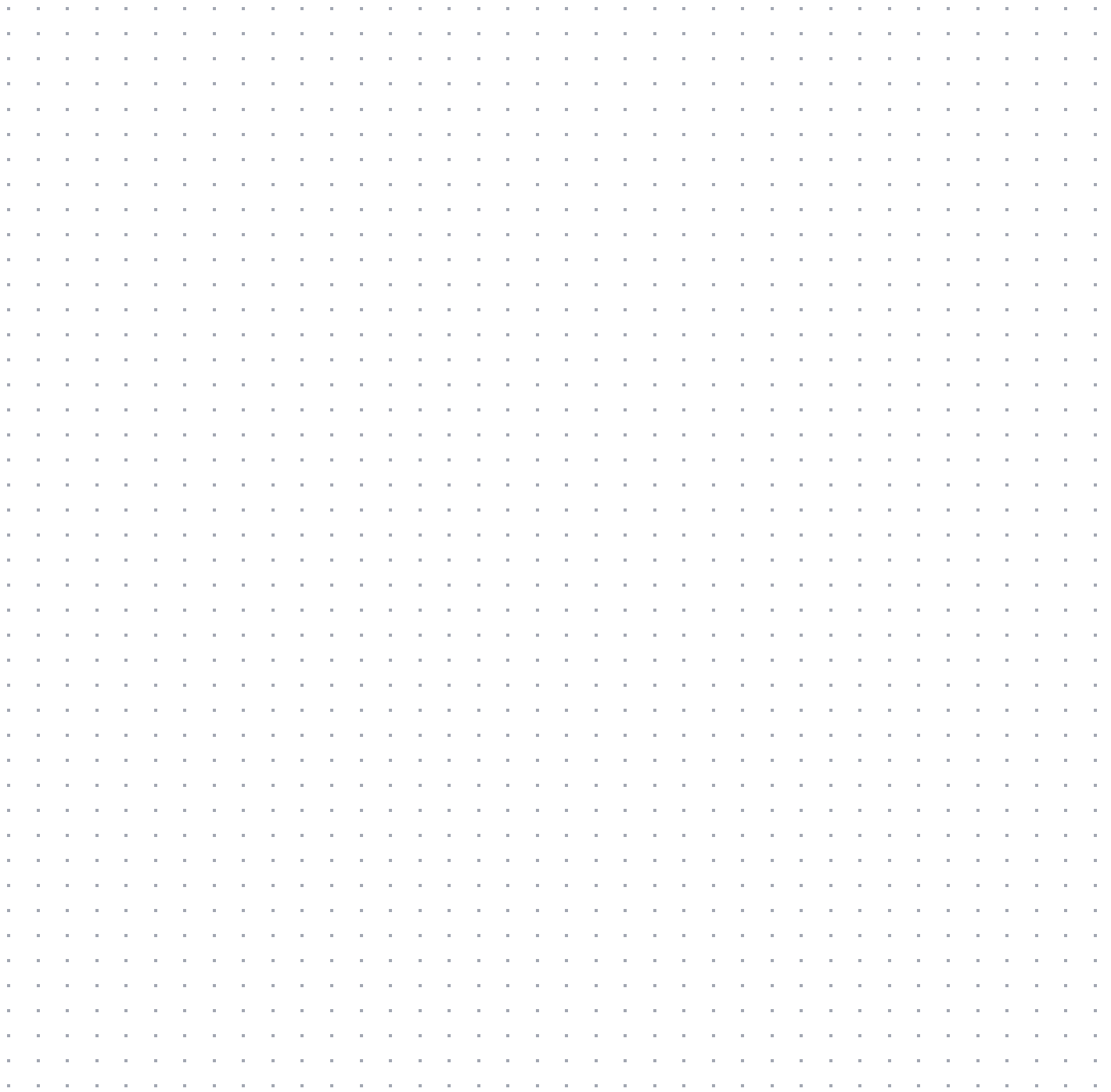
\* Complies with the guaranteed minimum shelf life;  
generally the period between the manufacturing date  
and the best-use-before-date is longer.



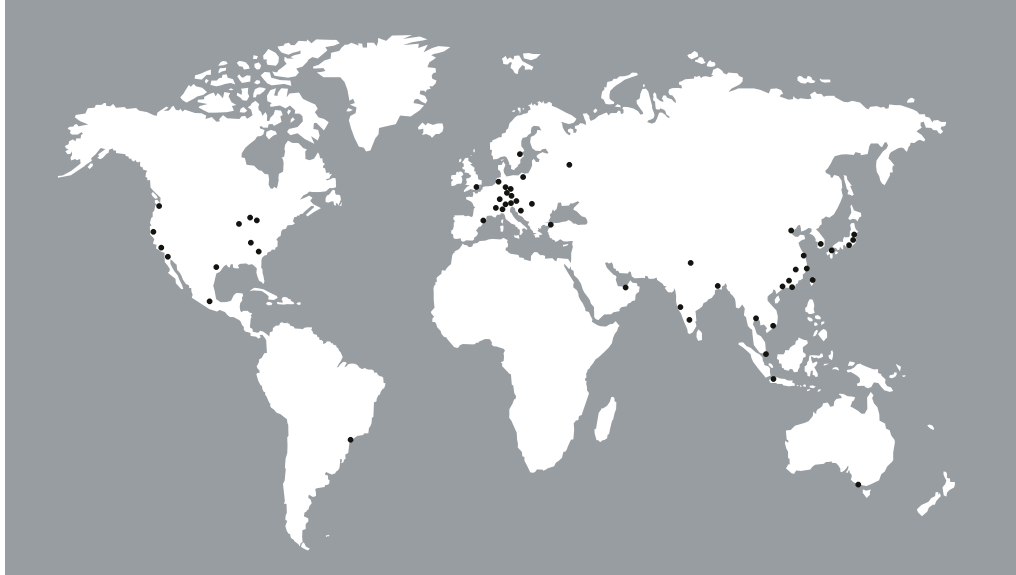
Curing time	Hardness Shore A	Tensile strength [N/mm <sup>2</sup> ]	Elongation at break [%]	Volume resistivity [Ohm cm]	Shelf life* [Months]
10 min at 85 °C 5 min at 125 °C	10	n.a.	n.a.	1E+14	9
10 min at 85 °C 2 min at 125 °C	30	5.0	550	1E+14	9
10 min at 85 °C 5 min at 125 °C	60	5.5	350	1E+14	9
2 h at 23 °C	35	2.1	250	1E+14	12
1 h at 23 °C	35	1.2	120	1E+14	6
2 h at 23 °C	40	2.0	200	1E+14	6
24 h at 23 °C	20	1.0	80	n.a.	9
24 h at 23 °C	8–12	1.0	120	n.a.	9

Further information is available in our brochure: Bonding, sealing, potting/encapsulation and coating with RTV silicone rubber compounds (6019e)

# YOUR NOTES



# WACKER AT A GLANCE



**WACKER** is a technological leader in the chemical and electrochemical industries and a worldwide innovation partner to customers in many key global sectors. With around 14,400 employees, WACKER generated sales of €2.76 billion in 2005. Germany accounted for 21% of sales, Europe (excluding Germany) for 31%, the Americas for 22% and Asia-Pacific, including the rest of the world, for 26%. Headquartered in Munich, Germany, WACKER has some 20 production sites worldwide and a global network of over 100 sales offices. With R&D spending at 5.3% of sales in 2005, WACKER is among the world's most research-intensive chemical companies.

## **WACKER SILICONES**

is a leading supplier of complete silicone-based solutions that comprise products, services and conceptual approaches. As a provider of solutions, the business division helps customers press ahead with innovations, exploit global markets fully, and optimize business processes to reduce overall costs and boost productivity. Silicones are the basis for products offering highly diverse properties for virtually unlimited fields of application, ranging from the automotive, construction, chemical, electrical engineering and electronics industries, through pulp and paper, cosmetics, consumer care and textiles, to mechanical engineering and metal processing.

## **WACKER POLYMERS**

is the global leader for high-quality binders and polymer additives. This business division's activities encompass construction chemicals and functional polymers for lacquers, surface coatings and other industrial applications, as well as basic chemicals, i. e. acetlys. Products such as dispersible polymer powders, dispersions, solid resins, powder binders and surface coating resins from WACKER POLYMERS are used in the construction, automotive, paper and adhesives industries, as well as by manufacturers of printing inks and industrial coatings.

## **WACKER FINE CHEMICALS**

is an expert in organic synthesis, silane chemistry and biotechnology, providing tailored solutions for its customers in the life sciences and consumer care industries. The range of innovative products includes complex organic intermediates, organosilanes, chiral products, cyclodextrins and amino acids.

With its comprehensive expertise, WACKER FINE CHEMICALS is a preferred partner for highly challenging custom-manufacturing projects in the fields of chemistry and biotechnology.

## **WACKER POLYSILICON**

has been producing hyperpure silicon for the semiconductor and photovoltaics industries for over 50 years. As one of the largest global manufacturers of polycrystalline silicon, WACKER POLYSILICON supplies leading wafer and solar-cell manufacturers.

## **Siltronic**

is one of the world's leading producers of hyperpure silicon wafers, supplying many major chip manufacturers. Siltronic develops and produces wafers up to 300 mm in diameter at facilities in Europe, the USA, Asia and Japan. Silicon wafers form the basis of state-of-the-art micro and nanoelectronics used, for example, in computers, telecommunications, motor vehicles, medical technology, consumer electronics and control systems.

**WACKER**

CREATING TOMORROW'S SOLUTIONS

The data presented in this technical data sheet are in accordance with the present state of our knowledge, but do not absolve the user from carefully checking all supplies immediately upon receipt. We reserve the right to alter product constants within the scope of technical progress or new developments. The information given in this technical data sheet should be checked by preliminary trials because of conditions during processing over which we have no control, especially where other companies' raw materials are also being used. The information provided by us does not absolve the user from the obligation of investigating the possibility of infringement of third parties' rights and, if necessary, clarifying the position. Recommendations for use do not constitute a warranty, either express or implied, of the fitness or suitability of the product for a particular purpose.

**WACKER** **SILICONES**

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